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## **Mark Scheme (Results)**

October 2017

Pearson Edexcel International Advanced Level  
In Biology (WBI02) Paper 01  
Development, Plants and the Environment

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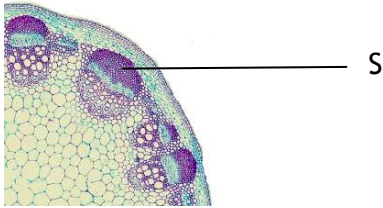
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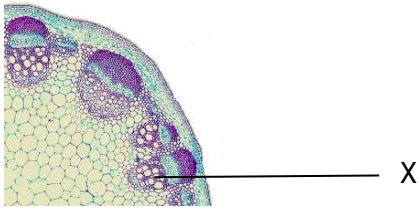
## General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

| Question Number | Answer  | Additional guidance   | Mark       |
|-----------------|---|---|------------|
| <b>1(a)</b>     | polysaccharide ;<br>α glucose ;<br>(1,4- and/or 1,6-) glycosidic ;<br>amyloplasts ; | <b>ACCEPT</b> carbohydrate / polymer<br><b>NOT</b> beta glucose<br><br><b>ACCEPT</b> chloroplasts | <b>(4)</b> |

| Question Number | Answer   | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| <b>1(b)</b>     | 1. reference to microfibrils ;<br><br>2. hydrogen bonds hold cellulose {molecules / chains /eq} together ;<br><br>3. criss cross arrangement of {cellulose / microfibrils} / eq ;<br><br>4. in (matrix of) {pectin / pectate / hemicellulose}; | <b>IGNORE</b> fibrils / microfibrines<br><b>NOT</b> myofibrils<br><br><b>3.ACCEPT</b> network / mesh of microfibrils | <b>(3)</b> |

| Question Number | Answer  | Additional guidance  | Mark       |
|-----------------|---|--|------------|
| <b>2(a)(i)</b>  |  | <p><b>ACCEPT</b> in equivalent positions in other vascular bundles</p> <p><b>ACCEPT</b> multiple label lines if <b>all</b> are correct</p> | <b>(1)</b> |

| Question Number | Answer  | Additional guidance  | Mark       |
|-----------------|---|--|------------|
| <b>2(a)(ii)</b> |  | <p><b>ACCEPT</b> in equivalent positions in other vascular bundles</p> <p><b>ACCEPT</b> multiple label lines if <b>all</b> are correct</p> | <b>(1)</b> |

| Question Number | Answer  | Additional guidance   | Mark       |
|-----------------|---|---|------------|
| <b>2(b)</b>     | <ol style="list-style-type: none"> <li>1. (both) have {cellulose / microfibrils} ;</li> <li>2. (both) have secondary thickening ;</li> <li>3. (both) contain lignin ;</li> <li>4. (both) contain pits ;</li> <li>5. (both) are composed of dead cells ;</li> <li>6. (both) are {hollow / have no cytoplasm / eq} ;</li> </ol> | <ol style="list-style-type: none"> <li>2. ACCEPT secondary walls</li> <li>3. ACCEPT "they are lignified"</li> </ol> | <b>(3)</b> |

| Question Number | Answer   | Additional guidance | Mark       |
|-----------------|--|---------------------|------------|
| <b>2(c)</b>     | 1. (group of) cells ;<br>2. with similar {structure / function / origin} ; |                     | <b>(2)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>3(a)(i)</b>  | <p><b>3(a)(i). The only correct answer is C</b></p> <p><i>A is not correct because the cell membrane, mitochondria ,nucleus and ribosomes are all found in both plant and animal cells</i></p> <p><i>B is not correct because the cell membrane, mitochondria ,nucleus and ribosomes are all found in both plant and animal cells</i></p> <p><i>D is not correct because the cell wall is found only in plant cells</i></p> | <b>(1)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>3(a)(ii)</b> | <p><b>3(a)(ii). The only correct answer is A</b></p> <p><i>B is not correct because the cell wall is the only structure found in plant cells but not animal cells</i></p> <p><i>C is not correct because the cell wall is the only structure found in plant cells but not animal cells</i></p> <p><i>D is not correct because the cell wall is the only structure found in plant cells but not animal cells</i></p> | <b>(1)</b> |

| Question Number  | Answer   | Mark       |
|------------------|--|------------|
| <b>3(a)(iii)</b> | <p><b>3(a)(iii). The only correct answer is A</b></p> <p><i>B is not correct because all of the structures listed are found in both animal and plant cells</i></p> <p><i>C is not correct because all of the structures listed are found in both animal and plant cells</i></p> <p><i>D is not correct because all of the structures listed are found in both animal and plant cells</i></p> | <b>(1)</b> |

| Question Number | Answer  | Mark       |
|-----------------|---|------------|
| <b>3(a)(iv)</b> | <p><b>3(a)(iv). The only correct answer is C</b></p> <p><b>A</b> is <i>not correct</i> because the only structures found in all three types of cell are the cell membrane and ribosomes</p> <p><b>B</b> is <i>not correct</i> because the only structures found in all three types of cell are the cell membrane and ribosomes</p> <p><b>D</b> is <i>not correct</i> because the only structures found in all three types of cell are the cell membrane and ribosomes</p> | <b>(1)</b> |

| Question Number | Answer                | Additional guidance              | Mark       |
|-----------------|-----------------------|----------------------------------|------------|
| <b>3(b)(i)</b>  | molecular phylogeny ; | <b>ACCEPT</b> phonetic spellings | <b>(1)</b> |

| Question Number | Answer   | Mark       |
|-----------------|--|------------|
| <b>3(b)(ii)</b> | <p><b>3(b)(ii). The only correct answer is B</b></p> <p><b>A</b> is <i>not correct</i> as they do not show species F and G as being more closely related</p> <p><b>C</b> is <i>not correct</i> as they do not show species F and G as being more closely related</p> <p><b>D</b> is <i>not correct</i> as they do not show species F and G as being more closely related</p> | <b>(1)</b> |



| Question Number | Answer  | Additional guidance  | Mark       |
|-----------------|---|--|------------|
| <b>4(a)(i)</b>  | <ol style="list-style-type: none"> <li>1. they have {different number of / between 1 and 3 / eq } mitochondria ;</li> <li>2. they have different {sizes / volumes} of mitochondria ;</li> <li>3. idea that total volumes of mitochondria are similar ;</li> </ol> | <p><b>IGNORE</b> comments about one cell (eg cell 1 has the largest mitochondrion / cell 2 has most mitochondria)</p> <p>Must refer to total / combined volume</p> | <b>(2)</b> |

| Question Number | Answer  | Additional guidance  | Mark       |
|-----------------|---|--|------------|
| <b>4(a)(ii)</b> | <ol style="list-style-type: none"> <li>1. only three yeast cells used / eq ;</li> <li>2. looking at the whole of a yeast cell is difficult / the number of mitochondria may have been mis-counted / eq ;</li> <li>3. idea that measuring the volume of a mitochondrion accurately is difficult ;</li> </ol> | <p><b>1.ACCEPT</b> too few / not enough cells were measured</p> <p><b>1.ACCEPT</b> small sample size</p> | <b>(2)</b> |

| Question Number | Answer  | Additional guidance   | Mark       |
|-----------------|---|---|------------|
| <b>4(b)(i)</b>  | <p>1. (volume of section =) <math>11 \times 0.09 / 0.99</math> ;</p> <p>2. (number of sections in one cell =) <math>13.5 \div 0.99 / 13.636</math> ;</p> <p>3. (number of ribosomes per cell / <math>\times 20\ 200</math> =) <math>275454 / 275455</math> ;</p> <p>OR</p> <p>1. <math>13.5 \div 11 / 1.23</math> ;</p> <p>2. <math>\div 0.09 / 13.64</math> ;</p> <p>3. <math>275454 / 275455</math> ;</p> | <p><b>Correct answer alone gains three marks</b></p> <p><b>3.DO NOT ACCEPT</b> decimal places in final answer</p> | <b>(3)</b> |

| Question Number | Answer  | Additional guidance  | Mark       |
|-----------------|---|--|------------|
| <b>4(b)(ii)</b> | <ol style="list-style-type: none"> <li>1. idea that counting ribosomes is difficult as they are small ;</li> <li>2. ribosomes may be unevenly distributed / section used is not representative ;</li> <li>3. idea that ribosomes may be hidden behind other structures ;</li> <li>4. idea that measurements of a section may not be accurate ;</li> <li>5. idea that a (yeast) cell is not a regular shape ;</li> </ol> | <p><b>2.ACCEPT</b> only one section was measured</p> <p><b>3.IGNORE</b> references to some ribosomes are on rough ER</p> | <b>(2)</b> |

| Question Number  | Answer   | Additional guidance   | Mark       |
|------------------|--|---|------------|
| <b>4(b)(iii)</b> | <ol style="list-style-type: none"> <li>1. protein synthesis / translation ;</li> <li>2. to fold the protein / eq ;</li> <li>3. protein transport /eq ;</li> <li>4. to package the protein into vesicles ;</li> </ol> | <p><b>1. ACCEPT</b> references to protein synthesis in ribosomes (on rough ER)</p> <p><b>2.ACCEPT</b> formation of secondary / tertiary structure</p> <p><b>3. ACCEPT</b> to isolate protein from rest of cytoplasm</p> | <b>(3)</b> |

| Question Number | Answer   | Additional guidance   | Mark       |
|-----------------|--|---|------------|
| <b>4(c)</b>     | Eukaryota contain {(rough) endoplasmic reticulum / mitochondria / membrane bound organelles} ; | <p><b>ACCEPT</b> Eukarya</p> <p><b>IGNORE</b> ribosomes</p> | <b>(1)</b> |

| Question Number | Answer                                     | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| <b>5(a)(i)</b>  | idea of characteristics (of an organism) ; | <b>ACCEPT</b> traits / features / eq<br><b>ACCEPT</b> physical / external appearance | <b>(1)</b> |

| Question Number | Answer                             | Additional guidance | Mark       |
|-----------------|------------------------------------|---------------------|------------|
| <b>5(a)(ii)</b> | alleles (present in an organism) ; |                     | <b>(1)</b> |

| Question Number  | Answer   | Additional guidance                    | Mark       |
|------------------|--|--|------------|
| <b>5(a)(iii)</b> | 1. biotic and abiotic factors / eq ;<br>2. in a habitat / eq ; | <b>ACCEPT</b> surroundings / ecosystem | <b>(2)</b> |

| Question Number | Answer  | Additional guidance  | Mark       |
|-----------------|---|--|------------|
| <b>5(b)(i)</b>  | 1. increase in temperature decreases the number of facets in wild type and ultra bar but increases number of facets in infra bar / eq ;<br>2. decrease in number of facets in wild type (as temperature increases) is greater than in ultra bar ;<br>3. credit comparative use of figures ; | <b>1.Piece together answer</b> if necessary<br><br><b>2. ACCEPT</b> decrease in number of facets in ultra bar (as temperature increases) is less than in wild type<br><br><b>3.ACCEPT</b> the following values a decrease of 260 /26% facets in wild type, a decrease of 130/68% in ultra bar, an increase of 110/65% in infra bar | <b>(2)</b> |

| Question Number | Answer   | Additional guidance | Mark       |
|-----------------|--|---------------------|------------|
| <b>5(b)(ii)</b> | <ol style="list-style-type: none"> <li>idea that if only {environment / temperature} affected phenotype then there would be no difference between the types of fruit fly ;</li> <li>idea that if only genotype affected phenotype then the number of facets would be the same at all temperatures ;</li> </ol> |                     | <b>(2)</b> |

| Question Number  | Answer  | Additional guidance   | Mark       |
|------------------|---|---|------------|
| <b>5(b)(iii)</b> | <ol style="list-style-type: none"> <li>homologous chromosomes {pair up / eq} ;</li> <li>{chromatids from a pair of chromosomes / non-sister chromatids} overlap ;</li> <li>reference to {chiasma / chiasmata} ;</li> <li>break in {chromatid / DNA (molecule)} ;</li> <li>{recombination / eq} of {chromatids / DNA / alleles} ;</li> </ol> | <p><b>1.ACCEPT</b> there are pairs of homologous chromosomes</p> <p><b>5. ACCEPT</b> exchange of DNA/alleles/genetic material/section of chromatid<br/> <b>5. DO NOT ACCEPT</b> genes / chromosomes</p> | <b>(3)</b> |

| Question Number | Answer   | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| <b>6(a)</b>     | <ol style="list-style-type: none"> <li>1. acidic treatment decreases (tensile) strength ;</li> <li>2. alkali treatment and heat treatment increase (tensile) strength;</li> <li>3. credit correct manipulation of figures ;</li> </ol> | <p><b>IGNORE</b> any comments about bagasse</p> <p><b>2.Piece together answer</b> if necessary</p> <p><b>3.</b> e.g. heat treatment increases tensile strength by 270 MPa<br/>Units are required</p> | <b>(3)</b> |

| Question Number | Answer  | Additional guidance   | Mark       |
|-----------------|---|---|------------|
| <b>6(b)</b>     | <ol style="list-style-type: none"> <li>1. alkali treatment increases (tensile) strength in bananas but decreases it in bagasse ;</li> <li>2. acidic treatment decreases (tensile) strength in both ;</li> <li>3. heat treatment increases (tensile) strength in both ;</li> </ol> | <p><b>Piece together answer</b> if necessary</p> <p><b>ACCEPT</b> stronger and weaker as eq to increases and decreases</p> <p><b>IGNORE</b> any quantities quoted</p> | <b>(2)</b> |

| Question Number | Answer   | Additional guidance  | Mark       |
|-----------------|--|--|------------|
| *6(c)           | <p><b>QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence.</b></p> <ol style="list-style-type: none"> <li>1. description of extracting fibres;</li> <li>2. idea of treating the banana fibres and bagasse with all (three) treatments and using untreated fibres as a control ;</li> <li>3. idea of standardising treatment ;</li> <li>4. credit relevant control variable;</li> <li>5. description of apparatus set up to be used;</li> <li>6. idea of hanging masses (gradually) ;</li> <li>7. idea of recording heaviest mass that does not break the fibre ;</li> <li>8. idea of repeating to calculate a mean ;</li> </ol> | <p><b>QWC – Emphasis is on logical sequence</b></p> <ol style="list-style-type: none"> <li>1. eg soaking in water / reference to retting</li> <li>2. Piece together answer if necessary</li> <li>3. e.g. same time, same concentration / volume of chemicals (not amount)</li> <li>4.<b>ACCEPT</b> length /width / cross-sectional area / diameter of fibre / temperature / humidity</li> <li>5.<b>ACCEPT</b> e.g. clamping fibres between two stands / suspending fibre from forcemeter /spring balance /clamp or using a pulley</li> <li>7. <b>ACCEPT</b> record the mass when the fibre breaks</li> </ol> | <b>(5)</b> |

| Question Number | Answer  | Additional guidance                    | Mark       |
|-----------------|---|--|------------|
| <b>6(d)</b>     | <ol style="list-style-type: none"> <li>1. idea that {they are a renewable resource / they can be regrown} ;</li> <li>2. resource will be available to future generations ;</li> <li>3. idea of replacing the use of {non-renewable / more valuable / eq} materials ;</li> </ol> | <b>2. ACCEPT</b> they will not run out | <b>(2)</b> |



| Question Number  | Answer  | Additional guidance  | Mark       |
|------------------|---|--|------------|
| <b>7(a)(i)</b>   | 1. {number / variety / range} of species in an area ;<br>2. {13 / minimum of 13} finches in Galapagos;            | <b>1.ACCEPT</b> habitat/ecosystem /region<br><b>1.NOT</b> organisms<br><br>"number of species of finches in the Galapagos" gains mp1 and 2 | <b>(2)</b> |
| <b>7(a)(ii)</b>  | 1. species found in {one / a small} area / eq ;<br>2. (these) finches found only in Galapagos ;                   | <b>1.IGNORE</b> organisms<br><b>1.IGNORE</b> habitat<br><br>"finches can only be found in Galapagos islands" gains mp1 and 2               | <b>(2)</b> |
| <b>7(a)(iii)</b> | 1. role of {a species / an organism} in its {habitat / community /environment eq} ;<br>2. credit role of finches; | e.g. provide food for predator, seed dispersal , feed on seeds;  | <b>(2)</b> |

| Question Number | Answer  | Additional guidance   | Mark       |
|-----------------|---|---|------------|
| <b>*7b</b>      | <p><b>QWC – Spelling of technical terms must be correct and the answer must be organised in a logical sequence.</b></p> <ol style="list-style-type: none"> <li>1. selection pressure is lack of {food / seeds} ;</li> <li>2. finches that have a more powerful beak can {survive / feed on the seeds} ;</li> <li>3. a powerful beak (shape) is due to a mutation;</li> <li>4. idea that finches with {advantageous / eq} alleles (survive) to breed ;</li> <li>5. {advantageous / eq} alleles passed onto offspring ;</li> <li>6. idea that the allele frequency for powerful beak shape will increase ;</li> <li>7. idea that an increase in more powerful beaks with time is evolution ;</li> <li>8. idea that a change in an environmental condition changing {phenotype / allele frequency} is natural selection ;</li> </ol> | <p><b>QWC – Emphasis is on clarity of expression</b></p> <p><b>ACCEPT</b> longer / deeper beak as eq to more powerful beak throughout</p> <p><b>1.ACCEPT</b> decrease of seeds<br/>harder seeds</p> <p><b>2.ACCEPT</b> finches that have a less powerful beak {do not survive / cannot feed on the seeds}</p> <p><b>6.IGNORE</b> allele frequency will change</p> | <b>(6)</b> |

| Question Number | Answer                             | Additional guidance              | Mark       |
|-----------------|------------------------------------|----------------------------------|------------|
| <b>8(a)</b>     | 30 / thirty / thirty chromosomes ; | <b>ACCEPT</b> phonetic spellings | <b>(1)</b> |

| Question Number | Answer  | Additional guidance   | Mark       |
|-----------------|---|---|------------|
| <b>8(b)</b>     | <ol style="list-style-type: none"> <li>1. idea that sexual reproduction results in genetic variation ;</li> <li>2. so more likely some hydra will survive ;</li> <li>3. idea that asexual reproduction will produce genetically identical hydra ;</li> <li>4. idea that these hydra will be suited to the existing conditions ;</li> <li>5. idea that the number of hydra will increase more rapidly ;</li> </ol> | <b>1. ACCEPT</b> meiosis / crossing over / random assortment<br><b>1.ACCEPT</b> maintains genetic variation | <b>(4)</b> |

| Question Number                   | Answer  | Additional guidance      | Mark                     |                          |    |    |                                   |                          |                          |          |                          |                                   |                          |                          |                          |          |                                   |          |                          |                          |                          |  |            |
|-----------------------------------|---|--------------------------|--------------------------|--------------------------|----|----|-----------------------------------|--------------------------|--------------------------|----------|--------------------------|-----------------------------------|--------------------------|--------------------------|--------------------------|----------|-----------------------------------|----------|--------------------------|--------------------------|--------------------------|--|------------|
| <b>8(c)(i)</b>                    | <table border="1"> <thead> <tr> <th>Stage of mitosis</th> <th>0</th> <th>15</th> <th>30</th> <th>60</th> </tr> </thead> <tbody> <tr> <td>Number of chromosomes in prophase</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><b>X</b></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Number of chromatids in metaphase</td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><b>X</b></td> </tr> <tr> <td>Number of chromatids in telophase</td> <td><b>X</b></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table> | Stage of mitosis         | 0                        | 15                       | 30 | 60 | Number of chromosomes in prophase | <input type="checkbox"/> | <input type="checkbox"/> | <b>X</b> | <input type="checkbox"/> | Number of chromatids in metaphase | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <b>X</b> | Number of chromatids in telophase | <b>X</b> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |  | <b>(3)</b> |
| Stage of mitosis                  | 0   | 15                       | 30                       | 60                       |    |    |                                   |                          |                          |          |                          |                                   |                          |                          |                          |          |                                   |          |                          |                          |                          |  |            |
| Number of chromosomes in prophase | <input type="checkbox"/>  | <input type="checkbox"/> | <b>X</b>                 | <input type="checkbox"/> |    |    |                                   |                          |                          |          |                          |                                   |                          |                          |                          |          |                                   |          |                          |                          |                          |  |            |
| Number of chromatids in metaphase | <input type="checkbox"/>  | <input type="checkbox"/> | <input type="checkbox"/> | <b>X</b>                 |    |    |                                   |                          |                          |          |                          |                                   |                          |                          |                          |          |                                   |          |                          |                          |                          |  |            |
| Number of chromatids in telophase | <b>X</b>  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |    |    |                                   |                          |                          |          |                          |                                   |                          |                          |                          |          |                                   |          |                          |                          |                          |  |            |

| Question Number | Answer  | Additional guidance  | Mark       |
|-----------------|---|--|------------|
| <b>8(c)(ii)</b> | 1. idea that one cell divides (into two cells) ;<br>2. by {cleavage / division of cytoplasm / eq} ;<br>3. cell growth occurs / eq ;<br>4. idea of {replication / formation} of {organelles / named organelle } ;<br>5. reference to {RNA / protein} synthesis;<br>6. idea of respiration releasing {energy / ATP} ; | <b>1.ACCEPT</b> two daughter cells are formed<br><br><b>2.ACCEPT</b> description of membrane pinching off / infolding / eq | <b>(4)</b> |

